G. Title III of the Defense Production Act

The Defense Production Act (DPA) is the primary statutory authority aimed at ensuring timely availability of industrial resources and critical technology items that are essential for national defense. The purpose of the DPA, Title III Program is to create, maintain, modernize, or expand the productive capacities of domestic sources for critical components, technology items, and industrial resources essential for national defense and for which there is insufficient production capacity to meet these needs. A key objective of the Title III Program is to accelerate the transition of technologies from the R&D arena to affordable production and insertion into defense systems.

Title III accomplishes its objectives by providing domestic industry with a variety of incentives, which reduce the risk of establishing the needed capacity. These incentives include purchases, purchase commitments, development of substitutes, loans and loan guarantees and the purchase of advanced manufacturing equipment for installation in Government or privately owned facilities. Purchases and purchase commitments are the incentives used most frequently.

The Department organizes and executes the Title III program as a DoD-wide program, generally focusing on materials and components that can be used in a broad spectrum of defense systems. The Office of the Secretary of Defense provides top-level management, direction, and oversight. The Air Force, acting as the Executive Agent for the program, structures and executes approved and funded projects for the Department.

The Title III Program is unique among DoD programs since it is the only program that is focused on the creation or expansion of domestic production capacity.

In FY 2001 eleven Title III projects were active or under development. Projects being developed include three new Title III Projects under the Radiation Hardened Microelectronics Initiative. These projects will be executed in FY 2002.

ACTIVE PROJECTS

Laser Eye Protection (LEP)

The objective of this project is to establish a viable, highly responsive, and affordable production capacity for thin film dielectric coatings on polycarbonate substrates, which will be used to make laser protective eyewear. The widespread proliferation of lasers in military operations is posing an increasingly significant threat of eye injury to military personnel. Exposure to laser energy can cause injuries that range from temporary incapacitation to permanent blindness. Current eyewear using absorption organic dye technology severely reduces visible light transmission, which impairs the effective and safe performance of operational tasks when worn at night or in low-light conditions. This project will ensure the establishment of a domestic source with the capacity to supply affordable devices in sufficient quantities to meet defense needs.

Technical sponsors for this project include the Army's Military Eye Protection System (MEPS) Program Office within US Army Soldier and Biological Chemical Command; the Navy Project Manager for Aircrew Systems, Naval Air Systems Command; the Air Force 311th Human Systems Program Office; and the Air Force Research Laboratory.

The capacity established by this project will be capable of producing approximately 50,000 LEP units per year. In August 2000, a $5.39 million cost sharing contract was awarded to Rockwell Science Center, Thousand Oaks, CA. Title III funding is $4.09 million with the contractor providing an additional $1.30 million in cost sharing. The project is expected to run through mid-2002. There is an additional option for $0.78 million to provide for the production of 50 flight helmet visors each to the Navy and Air Force.

Silicon-on-Insulator (SOI) Wafers

The objective of this project is to establish a viable domestic source for SOI substrates capable of producing low-cost, high-performance devices that can be effectively and affordably inserted into DOD systems. SOI materials significantly reduce costs and improve the performance of electronic devices used in defense systems such as military satellite communications, upgrades for ballistic missiles, surveillance systems, and inertial navigation systems. SOI materials are also cost effective to fabricate low power and/or radiation tolerant devices.

In March 2000, a 4-year Technology Investment Agreement (TIA) was signed with Intersil Corporation, Melbourne, FL (formerly Harris Semiconductor Division). The total value of this effort is approximately $14.3 million. Title III incentives are $6.63 million with Intersil cost sharing the remaining amount. The TIA will incentivize Intersil to expand and create a merchant production capacity. The technical sponsor, Naval Surface Warfare Center (NSWC), Crane, IN continues to lend strong support for the program.

Microwave Power Tubes (MPT)

This project will strengthen the supplier base to the Microwave Power Tube (MPT) industry by selectively targeting supply chain problems associated with critical materials and components required by the MPT original equipment manufacturers (OEMs).

MPT OEMs require high quality materials and sub-components from their suppliers to meet stringent DoD system requirements. However, the supply base for such critical materials and sub-components has been unable, for various reasons, to respond to the needs of the OEMs. Consequently, MPT OEMs are having difficulty procuring critical materials and sub-components such as helix tapes, filament wires, and cathodes to the required specifications.

MPTs generate and amplify microwave energy for radar systems, electronic warfare systems, and telecommunications systems. They are required for applications requiring high frequency and high power. MPTs will be used in these and similar military applications for at least the next two to three decades since there are no foreseeable replacement technologies.

The Illinois Institute of Technology Research Institute (IITRI) is the project integrator for this initiative. The Naval Surface Warfare Center (NSWC), Crane, IN as the technical sponsor, and the Electronics Industry Association (EIA) both strongly support the program. This project was initiated in September 2000 with a contract value of $2.83 million. Additional FY 2001 funds of $1.88 million will be placed on contract in the first half of FY 2002.

Silicon Carbide (SiC) Substrates

The objective of this project is to establish long-term domestic sources of high-quality silicon carbide semiconductor substrates. This project will increase material availability, improve quality, reduce cost, and accelerate the insertion of SiC technology into defense applications. It will enable the transition to full scale manufacturing by establishing the capability to produce 75-mm diameter SiC substrates for device fabrication.

High power electronics and electronic power management are essential ingredients in future defense technologies which, in many cases, already exceed the basic physical properties of silicon (Si) based semiconductor devices. Semiconductor devices fabricated on SiC will enable the development of systems with performance capabilities that are unattainable with current materials. The advantages gained by the application of SiC technology are essential for the continued technological superiority of U.S. defense weapon systems. This initiative will strengthen the position of the U.S. industrial base with respect to this critical state-of-the-art technology.

In September 1999, the Air Force, as the Executive Agent for the Title III program, awarded contracts to Cree Inc., Durham, NC; Litton Airtron Inc., Morris Plains, NJ (since purchased by II-VI, Inc., Saxonburg, PA); and Sterling Semiconductor Inc., Danbury, CT. This project is planned to run through December 2002. Title III funding is $8.48 million with the contractors investing in excess of $9.0 million in cost sharing.

Titanium Metal Matrix Composites (Ti MMCs)

The objective of this project is to establish an economically viable production capability for Ti MMC materials by reducing the cost of Ti MMC parts to affordable levels and promoting the use of such parts in gas turbine engines and other aerospace applications.

Ti MMC is an advanced composite material of titanium reinforced with either silicon carbide particulate or filament. Parts fabricated with Ti MMC are significantly stronger, lighter, and considerably more resistant to the stress of extreme temperatures than conventional titanium or superalloys. This technology is key to improvements in propulsion systems for the next generation of commercial and military aircraft. Substantial cost, performance, and durability benefits are expected from the use of Ti MMC components in transport and fighter aircraft engines. Other potential applications for Ti MMCs include airframes, medical equipment, and chemical processing.

Ti MMCs will be used primarily for the fabrication of various gas turbine engine components, including fan blades, fan frames, actuators, rotors, vanes, cases, ducting, shafts, and liners. A major objective of the project is to demonstrate a "production ready" industry in time to incorporate this material in the Joint Strike Fighter (JSF). Other applications for use of this material include the F-22 (F119 engine) and the F-14/F-15/F-16 (F110 engine). Other DoD and commercial aircraft engine applications are expected to follow.

The project was initiated in August 1996 with the signing of a multi-phased, multi-year cooperative agreement between the Air Force and the Titanium Matrix Composites Turbine Engine Components Consortium. The Title III funded portion of this effort is $25 million with a matching industry cost share of $25 million. The project is scheduled to be completed in December 2001.

Power Semiconductor Switching Devices (PSSDs)

Power Semiconductor Switching Devices (PSSDs) are pervasive within defense and commercial sectors for a variety of power control, conversion, and conditioning applications. These devices are used as medium and high-power electrical switches for both military and commercial applications, replacing larger, heavier electro-mechanical switches. This allows for increased switching efficiency and power handling capability with reduced acquisition and life-cycle costs. Avionics, missiles, and command, control, communications, computers and intelligence (C^4I) applications will combine to dominate military power supply markets for PSSDs in the immediate future. These devices will be essential to future applications for aircraft, ships, and ground vehicles as well as directed energy weapons and systems such as the Electromagnetic Aircraft Launch System being developed by the Navy.

Title III incentives will be used to establish a production capacity, perform product and process improvement, and have customers evaluate and qualify devices. Total contract value is $11.47 million with Title III investing $9.67 million and the contractor cost sharing an additional $1.80 million. This project was initiated in August 1998 with the award of a contract to Silicon Power Company (SPCO) of Exton, PA. The project is scheduled to run through December 2003.

Wireless Vibration Sensors

The goal of this project is to strengthen domestic production capabilities for wireless vibration sensors by facilitating the insertion of these sensors in the Advanced Amphibious Assault Vehicle (AAAV) program. Wireless vibration sensor technology is a critical element in Condition-Based Maintenance (CBM).

Title III coordination and support will allow insertion of this superior technology into a variety of defense applications. This will result in improved reliability, maintainability and reduced life-cycle costs, and, in some cases, reduced acquisition costs. The development of a low cost, wireless vibration sensor will enable the widespread application of CBM to new and legacy systems. A major effort to bring CBM capability to the Marine Corps largest acquisition program, the AAAV, was initiated recently. The Joint Strike Fighter (JSF) program office, the Air Force, and the Navy are also evaluating this technology in order to realize similar savings. Title III funding for the project is $0.90 million.

Aluminum Metal Matrix Composites (Al MMCs)

The primary objective of this program was to design, fabricate, and test a selectively reinforced aluminum Al MMC single pin track shoe for the Bradley Fighting Vehicle System. An additional objective was to qualify the track for subsequent insertion on the Bradley Fighting Vehicle. The project demonstrated that Al MMCs provide an optimal cost/performance alternative approach to fabricating military components by combining a low cost, high performance silicon carbide whisker reinforcement with the high volume, near net shape processing capability of squeeze casting.

In addition to shoes for tracked vehicles, other applications for Al MMCs incorporating silicon carbide whisker include missile and space vehicle structural parts, powertrain parts, optical system components (e.g., mirrors), and electronic packaging components.

Replacing the current steel track with Al MMC track is expected to produce significant life cycle cost savings, reduce vehicle weight by 600 pounds, and extend track shoe service life from the current 600 miles to 3000 miles.

The U.S. Army Tank-Automotive and Armaments Command executed the project via a contract with Advanced Refractory Technologies, Inc., Buffalo, NY. The contract for this project was awarded in January 1998 and completed in December 2001. Title III investment in this project was $3 million.

PROJECTS UNDER DEVELOPMENT

Radiation Hardened (Rad Hard) Electronics Capital Expansion Initiative

This project will provide the funding to modernize and maintain a viable production base for radiation hardened microelectronics. The primary objective is to purchase and install up-to-date production equipment in the facilities of the remaining radiation hardened producers. This will enable them to migrate their manufacturing capabilities from the obsolescent 0.35-micron feature size to the 0.18/0.15-micron size needed to meet the performance requirements for future defense space and missile systems.

Advanced radiation hardened microelectronics are a critical technology required for national defense. Microelectronics in defense space and missile systems must be able to withstand the deleterious effects of radiation ranging from long-term exposure to naturally occurring radiation in space to extreme events such as the intense radiation from a nuclear burst. These forms of radiation produce both prolonged and immediate effects in microelectronics. Radiation hardening requirements for defense applications are unique and require special materials and manufacturing processes to produce devices that can function and survive in high radiation environments. Maintaining a capability to produce these components domestically is of vital national importance.

Several defense programs require radiation hardened microelectronics, including Space Based Infrared System-low (SBIRS-low) and Advanced Extremely High Frequency (AEHF) system, which require 0.25-micron technology, and Space Based Radar and Hyper Spectral Imaging, which require 0.18-micron technology.

All future major space and strategic missile programs are likely customers of the radiation hardened electronics that will be produced as a result of Title III investments.

Radiation Tolerant/Hardened Microprocessors for Missile and Space Applications

This project will establish a manufacturing capability for radiation tolerant and radiation hardened microprocessors for military and commercial space applications. The effort will involve productization of an advanced commercial microprocessor to meet military requirements for radiation hardening and production of the microprocessor. Emphasis will be placed on creating an accelerated (and repeatable) fabrication process and utilization of commercial capabilities for affordable production.

This project will enable production of an advanced microprocessor, capable of meeting increased processing needs and protecting against severe radiation levels. Radiation hardened microprocessors based on current commercial microprocessors will reduce the unit cost. Use of commercial technology will also ensure an industrial infrastructure capable of meeting the hardware, software, and technical support needs of the radiation hardened microprocessor for years to come. Strong technical sponsorship for this initiative is being provided by the Air Force Research Laboratory (AFRL/VSSE) and the Defense Threat Reduction Agency.

Radiation Hardened Thin Film Silicon-On-Insulator (SOI) Wafers for Digital Devices

This project will create and improve domestic production capabilities for Rad Hard thin film silicon-on-insulator (SOI) wafers for a variety of digital circuit applications. Emphasis will be placed on radiation hardening, improved material quality, increased production yields, and reduced production costs.

Radiation hardened thin film SOI wafers will significantly improve the radiation hardness and performance of microelectronic devices in numerous military space and strategic missile systems. It also enables significant improvements in key microelectronic device characteristics, such as reduced power consumption, increased circuit density, and faster performance. Radiation hardened thin film SOI wafers are used for fabricating radiation hardened ultra-large-scale digital devices such as microprocessors, application specific integrated circuits, and static random access memory. These devices are used in surveillance systems, communications systems, ballistic missile systems, radars, passive sensors, and inertial navigation systems. The project will leverage commercial SOI wafer fabrication processes to create a better-quality, lower-cost material for radiation hardened applications. The project will result in a world-class domestic production base that is responsive to defense needs for radiation hardened thin film SOI wafers.

Strong programmatic support for this project is provided by the Navy (Naval Surface Warfare Center - Crane, the Strategic Projects Office and the Naval Research Laboratory), the Defense Threat Reduction Agency, and the Sensors and Materials and Manufacturing Directorates of the Air Force Research Laboratory.